

# DAKOTA UNMANNED AERIAL OPERATIONS AND TRAINING MANUAL

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## **1.0 PREFACE AND SCOPE OF PROCEDURES**

- This document is the Flight Operations and Training Manual for conducting Agricultural Aircraft Operations with a DJI Agras MG-1P RTK under a Part 137 Commercial Aircraft Operator Certificate for Dakota Unmanned Aerial. The following procedures will promote the safe, efficient, and lawful operation of Dakota Unmanned Aerial UAS operations. Safety, above all else, is the primary concern in every operation, regardless of the nature of the mission.
- This manual is not all-inclusive, but as a supplement to other company guidelines, Federal Aviation Administration regulations, pre-flight safety checklists, aircraft manufacturers' approved flight manual, etc.
- This manual addresses Dakota Unmanned Aerial's UAS operations as they existed when drafted.
- Equipment, personnel, environment (internal and external), etc., change over time. Dakota Unmanned Aerial will update and revise this manual as needed to reflect changes in usage, technology, and practices.
- A copy of this manual (electronic or paper) is issued to each person having UAS responsibilities at Dakota Unmanned Aerial.

## **2.0 PROTECTION OF RIGHTS AND PRIVACY**

- Dakota Unmanned Aerial strives to perform its operations with a goal to persons' property rights and reasonable expectations of privacy before deploying a UAS. Dakota Unmanned Aerial holds its flight crew personnel accountable for ensuring that Dakota Unmanned Aerial UAS operations intrude to a minimal extent upon the private persons and businesses.
- Dakota Unmanned Aerial does not conduct random surveillance activities. The use of the UAS is limited to select employees of Dakota Unmanned Aerial for Dakota Unmanned Aerial business purposes.
- Dakota Unmanned Aerial operates UAS strictly within the laws and regulations. Before operating the UAS, Dakota Unmanned Aerial requires the Chief Supervisor of Operations to ensure that the proper forms and applications are applied for and obtained.

## **3.0 Crew Qualifications and Training**

- Dakota Unmanned Aerial Part 137 flights will be operated year-round. Recurrent training will take place on a yearly basis to ensure continued compliance.

### **Recurrent Training**

- The qualifications of all personnel to be involved in the flight operations will be reviewed to ensure compliance.
- A meeting will be conducted with all personnel to review the flight operations manual. Roles and responsibilities for the Chief Supervisor of Operations, Remote Pilot in Command and the Visual Observer will be reviewed.
- Each Remote Pilot in Command must complete a minimum of five flight operations with the UAS model type prior to conducting any Part 137 flights where hazardous chemicals are dispensed. This will serve to refamiliarize personnel with the aircraft and processes for

agricultural aircraft operations. These flights will be conducted in a manner consistent with how the aircraft is operated for Part 137 flights. Each of the five flight operations consists of a takeoff and landing cycle.

- Review methods and phraseology to be utilized for effective communication between the Visual Observer and Remote Pilot in Command during a flight operation
- Review Applicable Regulations:
  - 14 CFR 91.111 Operating near other aircraft
  - 14 CFR 91.113 Right-of-way rules
  - 14 CFR 91.155 Basic VFR Weather Minimums
  - 14 CFR 107.31 Visual line of sight aircraft operation
  - 14 CFR 107.33 Visual observer

### **Chief Supervisor of Operations**

- The Chief Supervisor of Operations (CSO) has ultimate responsibility for the safe operation of any UAS operated by any Remote Pilot in Command at Dakota Unmanned Aerial. As a result, the CSO has the final decision on whether to initiate or terminate any operation conducted by Dakota Unmanned Aerial.

### ***CSO Duties and Responsibilities***

- The CSO shall evaluate each mission. It is the CSO's responsibility to recognize risk and refuse all tasks with unacceptable risk. The CSO's decision is final as to whether the flight is safe to conduct.
- If at any time the operating site property owner or manager believes that a flight or operation is unsafe or deviates from the mission parameters, it is the CSO's responsibility to comply with such requests in a professional manner.
- Before launch, the CSO must understand the mission request and have all applicable documentation at the ground control station.
- The CSO is required to be aware of weather forecasts, winds, hazards, temporary flight restrictions, and all pertinent information necessary to perform the mission.
- The CSO is responsible for maintaining all certification documentation for Dakota Unmanned Aerial and all of its personnel.
- The CSO assures all personnel are current on all licensing (state/federal), laws, regulations, safety procedures associated with UAS missions at Dakota Unmanned Aerial.

### ***CSO Qualifications***

- Hold a valid U.S. driver's license
- Current FAA Remote Pilot Certificate
- South Dakota Pesticide Certification Air/Ground Core
- Demonstration of Applicable Knowledge and Skills to FAA FSDO

### ***CSO training***

- The CSO must be able to safely operate the UAS in a manner consistent with how the UAS will be operated under an exemption the FAA has granted to Dakota Unmanned Aerial, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles, and structures.
- Undergo the Documentation phase of CFR 14 part 137 certification process.
- Successfully pass the Demonstration and Inspection phase of CFR 14 part 137 certification process.

- To be current, the CSO must have conducted and logged at least three (3) launch and three (3) recovery operations within the previous ninety 90 days. These operations must have been conducted on a registered UAS of the same class as the UAS to be flight tested, and in a comparable environment.
- All members within the unit shall maintain proficiency in their operator/observer abilities. Persons who do not have any documented training or flight time within 90 days will have to exhibit their skill before being an operator/observer during a deployment or exercise.
- Recurrent training is not limited to actual operating/observer skills but includes knowledge of all pertinent UAS/aviation matters.

### **Remote-Pilot-in-Command**

- The Remote-Pilot-in-Command (RPIC) has all the responsibility and authority of the pilot in command, as described by 14 C.F.R. § 91.3, Responsibility and Authority of the Pilot in Command. The RPIC has ultimate responsibility for the safe operation of the UAS. As a result, the RPIC has the final decision on whether to initiate or terminate any flight.

### ***RPIC Duties and Responsibilities.***

- The RPIC shall evaluate each mission. It is the RPIC's responsibility to recognize risk and refuse all tasks with unacceptable risk. The RPIC's decision is final as to whether the flight is safe to conduct.
- If at any time the operating site property owner or manager believes that a flight or operation is unsafe or deviates from the mission parameters, it is the RPIC's responsibility to comply with such requests in a professional manner.
- Before launch, the RPIC must understand the mission request and have all applicable documentation at the ground control station.
- The RPIC is required to be aware of weather forecasts, winds, hazards, temporary flight restrictions, and all pertinent information necessary to perform the mission.

### ***RPIC Qualifications***

- Hold a valid U.S. driver's license
- Current FAA Remote Pilot Certificate
- South Dakota Pesticide Certification Air/Ground Core
- Demonstration of Applicable Knowledge and Skills to Chief Supervisor of Operations

### ***RPIC training***

- The RPIC must be able to safely operate the UAS in a manner consistent with how the UAS will be operated under an exemption the FAA has granted to Dakota Unmanned Aerial, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles, and structures.
- To be current, the RPIC must have conducted and logged at least three (3) launch and three (3) recovery operations within the previous ninety 90 days. These operations must have been conducted on a registered UAS of the same class as the UAS to be flight tested, and in a comparable environment.
- Before a person can perform the role of RPIC, they must conduct a demonstration flight to show their ability and knowledge of the UAS to the Chief Supervisor of Operations.
- All members within the unit shall maintain proficiency in their operator/observer abilities. Persons who do not have any documented training or flight time within 90 days will have to exhibit their skill before being an operator/observer during a deployment or exercise.

- Recurrent training is not limited to actual operating/observer skills but includes knowledge of all pertinent UAS/aviation matters.
- Failure to prove proficiency can result in removal from UAS responsibilities.

### ***Visual Observer (VO) (As Needed)***

Some flight operations may require at least one visual observer (VO) to offer a viewpoint that is distinct from the RPIC. The RPIC may also require multiple observers. Each VO will complete internal training on roles and responsibilities of the visual observer for Part 107 / Part 137 flight operations.

### ***VO Duties and Responsibilities***

- Assist and advise the RPIC in maintaining situational awareness and complying with his/her “see-and-avoid” duties;
- Maintain a view of the flight operations and surrounding areas to scan for potentially conflicting traffic or other hazards;
- Maintain communication with the RPIC.

### ***VO Qualifications***

Personnel working as a VO shall have the following qualifications:

- Sufficient knowledge of the airspace and working environment detailed in this manual will permit them to assess the risks posed by other aircraft or objects adequately.
- Familiarity with and knowledge of the Remote Pilot - Small
- Unmanned Aircraft Systems, Airman Certification
- Standards, as published by the FAA, and the requirements
- described in 14 C.F.R. § 91.111, § 91.113, and § 91.115. The
- UAS should never be intentionally operated in the vicinity of
- human-crewed aircraft, and is to give the right-of-way under
- all circumstances;
- Knowledge of basic VFR weather minimums;
- Maintain a thorough understanding of all normal, abnormal, and emergency operational aspects of the UAS.
- No one may act as a VO unless they have read and familiarized themselves with the contents of this Manual;
- The RPIC and Dakota Unmanned Aerial must approve all VO personnel;
- Have access to Pilot’s Handbook of Aeronautical Knowledge, as published by the FAA;
- Have familiarity and a working knowledge of operations manuals prepared by the manufacturer of UAS utilized by Dakota Unmanned Aerial; and such other credentials as may be requested by Dakota Unmanned Aerial customers.

### ***VO Training***

- The VO must understand how the UAS will operate under any exemption the FAA has granted to Aris, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles, and structures.
- The VO must be briefed by the PIC before each flight to ensure a consistent understanding of each operation.
- VO must have been provided with sufficient training to communicate clearly to the operator any turning instructions required to stay clear of conflicting traffic and obstacles.
- Observers receive training on rules and responsibilities described in 14 C.F.R. § 91.111, Operating Near Other Aircraft, 14 C.F.R. § 91.113, Right-of-Way Rules, cloud clearance, in-

flight visibility, and the pilot controller glossary including standard ATC phraseology and communication. 14 C.F.R. § 91.17, Alcohol or Drugs, applies to UAS observers.

- All VO shall maintain proficiency in their observer abilities. Personnel who do not have any documented training or flight time within 90 days will have to exhibit skills before being an observer during a deployment or exercise.
- Recurrent training is not limited to actual operating/observer skills but includes knowledge of all pertinent UAS/aviation matters.
- Failure to prove proficiency can result in removal from UAS responsibilities.

#### **4.0 PRE-FLIGHT OPERATIONS**

- The RPIC is responsible for preflight activities before the start of the flight operation, including inspection of the aircraft, assessment of the operating location, briefing crew members involved in the process, and equipment checkouts. All flight operations are following the provision of 14 C.F.R. Part 107, state and local regulations, Dakota Unmanned Aerial exemptions, and the operator's manual for the subject aircraft.

##### **Planning**

- The flight crew shall be familiarized with all available information about the flight, such as take-off/landing, including but not limited to the operational limitations of Part 107, weather conditions, hazards, no-fly zones, etc.
- Before operations take place, Dakota Unmanned Aerial shall obtain approval from the person(s) who owns the right to access land.
- The RPIC shall ensure the location for take-off and emergency landing is adequate upon arrival at the site. Identify at least one emergency landing site before the start of operations.
- The RPIC shall be aware of all surroundings if an emergency landing is necessary. Includes the ability to recover the UAS.

##### **Inspection**

- Fully charged all batteries before the first flight of the day.
- Check the airframe for signs of damage, and its overall condition.
- Check the entire aircraft per the pre-flight inspection instructions in the manual for the specific aircraft to make sure it is in good structural condition, and no parts are damaged, loose, or missing.
- Check the rotor blades for chips, cracks, looseness, and any deformation.
- Perform an overall visual check of the aircraft before arming any power systems.
- Repair or replace any part found to be unsuitable for flying during the pre-flight procedures before takeoff.

##### **Weather**

- Before each flight, the RPIC and VO (*as needed*) shall gather enough information about the existing and anticipated near-term weather conditions. The RPIC shall utilize FAA-approved weather resources such as Meteorological Terminal Aviation Weather Reports (METARS), Terminal Area Forecasts (TAF), etc. to obtain the best information. To get the latest and most current weather conditions, Notices to Airmen (NOTAMs), and Temporary Flight Restrictions (TFR).

- Wind direction plays a significant factor in flight operations. Operators shall take precautions to ensure that wind conditions do not exceed the aircraft limits stated in the aircraft operations manual/specifications.
- The RPIC shall ensure that the flight occurs within the weather requirements specified all laws and regulations pertaining to the operation.

### **Checklist**

Part 107.49 requires a preflight inspection. If the preflight checklist provided by the manufacturer of the UAS is not available (or has not been developed), the RPIC shall utilize the Flight Checklist attached as Appendix 1. The CSO should ensure that any checklist from a manufacturer contains the following:

- Required documentation: Pilots Certificate, Aircraft Registration, UAS Flight Manual, Proof of Insurance.
- Weather conditions suitable.
- Check the airframe for cracks and check all screws are tight.
- Rotors not damaged and tightly fixed.
- Propulsion system mounting(s) secure.
- Batteries fully charged and securely mounted.
- Communications (datalink) check.
- Ensure the GPS module (if any) has GPS “fix.”
- Check the mission flight plan.
- “Return Home” or “Emergency Landing” locations are selected, and located appropriately.
- Calibrated all sensors and load correct settings.
- Complete flight crew briefing.
- Ensure the launch site is free of obstacles.
- Recheck wind direction before launch.
- Confirm phone number for the nearest Air Traffic Control facility
- in the event of an emergency.

### **Documentation**

Once the RPIC confirms the location is safe to fly and becomes familiarized with the surroundings, the RPIC shall complete a Pre-Flight Report substantially in the form of Appendix 1. The Pre-Flight Report shall include the following information.

- Altitudes to be flown
- Mission overview
- Planned flight time
- Contingency procedures
- RPIC name
- VO name(s) (*As Needed*)
- Date and time
- Product being applied
- Number of acres

## **5.0 DURING FLIGHT OPERATIONS**

- The UAS RPIC shall launch, operate, and recover from preset locations so the aircraft will fly according to the mission plan.



- After launch, the flight crew should have a clear view of the aircraft at all times, called Visual Line of Sight (VLOS). Observation locations should allow maximum line of sight throughout the planned flight operations area.
- All flight operations must be conducted using a minimum of an RPIC. Operations may utilize one or more VO's depending on the complexity of the flight mission to perform general safety, visual observation, hazard, and traffic avoidance.
- After the flight is going according to plan, the RPIC and VO (*if used*) must be able to maintain effective communication with each other at all times (Part 107.33).
- The RPIC should inform the VO (*as needed*) of what the aircraft is supposed to be doing at any given time.
- The VO (*if used*) should make the RPIC aware of any possible flight hazards during the flight.
- Upon any failure during the flight or any loss of visual contact with the UAS, the RPIC shall command the aircraft back to the recovery location or utilize the built-in fail-safe features to recover the aircraft. Emergency procedures, as defined in the specific UAS manufacturers operator's manual, should be followed.

## 6.0 POST FLIGHT OPERATIONS

- RPIC shall scan the landing area for potential obstruction hazards and recheck weather conditions.
- RPIC shall announce to the VO and any other people around that the aircraft is on the final approach and inbound to land.
- If the RPIC becomes aware that continued flight is not safe, due to an unexpected weather situation, emergency, hazard, or miscalculation, The RPIC should be prepared to reject or abort a take-off or landing, called a "go-around."
- Carefully land the aircraft away from any obstructions and people.

After landing:

- Shut down the UAS and disconnect the batteries.
- Visually check aircraft for signs of damage or excessive wear.
- Remove or empty the spray tank during transportation or when not in use to avoid damaging the landing gear. Store or dispose of any remaining liquid from the tank appropriately.
- Verify mission objectives.
- Complete logbook entries, recording flight time and other flight details.

## 7.0 EMERGENCY PROCEDURES

- The RPIC must abort the flight if unexpected circumstances or emergencies occur that could potentially degrade the safety of persons or property. The following are some abnormal conditions that could occur.
- Loss of data link:  
**Indication:** The aircraft status indicators will blink yellow rapidly.  
**Action:** If signal is lost for greater than 3 seconds, the aircraft will automatically initiate a Return to Home (RTH) maneuver.
- Loss of GPS:  
**Indication:** The aircraft status indicators will blink yellow slowly

**Action:** The Remote Pilot in Command must immediately take action to recover or land the small unmanned aircraft.

- Low Battery Level on Aircraft:

**Indication:** The Aircraft Status indicators slowly blink red

**Action:** Fly the aircraft back and land as soon as possible. Replace batteries.

- Critically Low Battery Level on Aircraft:

**Indication:** The Aircraft Status indicators will rapidly blink red.

**Action:** The aircraft will begin to descend and land automatically.

- Remote Controller Failure:

**Indication:** The remote controller status LED will blink red. A slow beep sound will be given.

**Action:** If the aircraft loses data link signal for greater than 3 seconds, the aircraft will automatically initiate a Return to Home (RTH) maneuver. The Maximum Height and Radius Limit Function of the aircraft assists in preventing fly away situations.

- Another aircraft in the airspace

**Indication:** The PIC or VO observe another aircraft in the vicinity.

**Action:** Depending on the location and trajectory of the other aircraft, various actions would be applicable to ensure safety.

- a. Continue monitoring the location of other aircraft to ensure safe separation.
- b. Execute a return to home.
- c. Land immediately.
- d. Maneuver to adjust altitude or location as needed if immediate evasive action is required.

## 8.0 FLIGHT AREA / PERIMETER MANAGEMENT

- Safety paramount concern. The selection of launch and landing sites is based first and foremost on safety. The RPIC shall ensure that all flight operations are within the FAA-issued airspace authorization parameters and UAS flight limits. Flight boundaries, including any restrictions imposed by FAA approvals, nearby airport locations, restricted areas, TFRs, etc.

### Required considerations

- Primary Take-off and Landing site. Typically, the primary landing shall be the same as the launch site, but they can be separate locations. The RPIC has final authority for any approaches.
- Alternate landing sites. The RPIC shall designate at least one alternative landing site. If a landing is not possible and the primary landing site is deemed unsafe, procedures to utilize the back-up site will invoke.
- Mission abort sites. The RPIC may optionally designate an alternate landing site whereby the aircraft may land in an emergency situation. The alternate landing site should minimize risk if the aircraft is required to vacate airspace in an emergency. If the RPIC deems it necessary, the UAS may be flown to this site and landed without regard to the risk to flight equipment or UAS aircraft. The safety of persons, human crewed aircraft, and property takes priority over the UAS.
- Flight over populated areas. The RPIC should make every effort to select a landing site that avoids approaches over populated areas.
- Landing safety and crowd control. All landing sites should be maintained and operated in the same manner as the launch sites. Allow spacing of at least 50 feet at all times between aircraft operations and all nonessential personnel (all personnel other than the UAS RPIC and the VO).

## 9.0 ACCIDENT REPORTING

Reporting Required within ten (10) calendar days after an accident (as defined by regulation) and before additional flights, the operator must provide notification to the FAA per Part 107.9.

The FAA defines an accident when:

- Any person suffers death or serious injury.
- Property damage, other than the UAS, if the cost is greater than \$500 to repair or replace the property.

Report Accident Online. The accident report can be submitted on the FAA's new "FAADroneZone" website using the following link:

<https://faadronezone.faa.gov/#/>

Report Accident to the FSDO. Reports to the nearest jurisdictional FSDO [www.faa.gov/about/office\\_org/field\\_offices/fsdo](http://www.faa.gov/about/office_org/field_offices/fsdo). The report should include the following information:

- RPIC's name and contact information;
- RPIC's FAA airman certification number;
- UAS' registration number issued to the aircraft, if required (FAA registration number);
- Location of the accident;
- Date of the accident;
- Time of the accident;
- Person(s) injured and extent of the injury, if any or known;
- Property damaged and extent of damage, if any or known; and
- Description of what happened.

## 10.0 FLIGHT CREW COMMUNICATIONS

- The knowledge of flight management process flow is crucial for effective communication. The RPIC, VO, and other Flight Personnel need to maintain contact at all times. During all operations, the VO and other Flight Personnel shall acknowledge that he/she received a message to facilitate the coordination of flight operations in an organized and effective manner.

## 11.0 EXTERNAL COMMUNICATION

- Ensure prior authorization from Air Traffic Control (ATC) is obtained before flight operations in Class B, C, D airspace, or within the lateral boundaries of the surface area of Class E airspace designated for an airport. Also, ensure required waivers, if any, are available on-site during flight operations. [https://www.faa.gov/uas/commercial\\_operators/part\\_107\\_waivers/](https://www.faa.gov/uas/commercial_operators/part_107_waivers/)
- Instructions for filing a waiver are at the website-link above. According to AC 107-2 5.8.1, "unless the flight is within controlled airspace, no notification or authorization is necessary to operate at or near an airport." When operating in the vicinity of an airport, the RPIC must be aware of all traffic patterns and approach corridors to runways and landing areas.
- When working in the vicinity of a non-towered airport within Class G Airspace two way

radio communication, with the Common Traffic Advisory Frequency (CTAF) or Unicom is not required under Part 107. The UAS flight crew should monitor the airport's CTAF or Unicom, and be familiar with airport operations and radio communication procedures. The RPIC should also have the local emergency responder's phone number on hand in case of emergencies  
[https://www.faa.gov/documentLibrary/media/Advisory\\_Circular/AC\\_107-2.pdf](https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_107-2.pdf)

## **12.0 DEFINITIONS**

*Aircraft* - any contrivance invented, used, or designed to navigate, or fly in, the air.

*Airport* - a landing area regularly used by aircraft for receiving or discharging passengers or cargo.

*Civil aircraft* - an aircraft except for a public aircraft.

*FAA* - U.S. Department of Transportation, Federal Aviation Administration.

*Landing area* - a place on land or water, including an airport or intermediate landing field, used, or intended to be used, for the takeoff and landing of aircraft, even when facilities are not provided for sheltering, servicing, or repairing aircraft, or for receiving or discharging passengers or cargo.

*FSDO* – Flight Safety District Officer

*RPIC* - Remote Pilot-in-Command

*UAS* - Unmanned Aerial System.

*VO* - Visual Observer.

## APPENDIX 1

FLIGHT CHECKLIST		
PRE FLIGHT	→ DURING FLIGHT	→ POST FLIGHT
<b>At office</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aircraft Documentation</li> <li><input type="checkbox"/> NOTAM</li> <li><input type="checkbox"/> Local regulations and permissions.</li> <li><input type="checkbox"/> Proximity to the airport.</li> <li><input type="checkbox"/> Weather condition permits flying.</li> <li><input type="checkbox"/> All Batteries Charged</li> <li><input type="checkbox"/> Flight Gear check</li> </ul>	<b>After launch</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Aircraft reached safe altitude.</li> <li><input type="checkbox"/> Confirm observer has the aircraft in sight.</li> <li><input type="checkbox"/> All systems green</li> <li><input type="checkbox"/> Satellite and GPS check</li> <li><input type="checkbox"/> Check Battery remaining</li> </ul>	<b>After landing</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Power down UAV</li> <li><input type="checkbox"/> Remove and safely store batteries</li> <li><input type="checkbox"/> Airframe inspection</li> <li><input type="checkbox"/> Check camera/ sensor to ensure data collected</li> <li><input type="checkbox"/> Transfer data and flight log</li> <li><input type="checkbox"/> Make logbook entry</li> </ul>
<b>In the field</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Scan area for obstacles, e.g. take-off and landing area.</li> <li><input type="checkbox"/> Wind check</li> <li><input type="checkbox"/> Daily Flight Report filled.</li> <li><input type="checkbox"/> Assemble UAV, ensure screws are tight and propeller check</li> <li><input type="checkbox"/> Sensor/ Camera setting check</li> <li><input type="checkbox"/> Batteries securely mounted</li> <li><input type="checkbox"/> Ensure GPS fix</li> <li><input type="checkbox"/> Confirm Mission flight plan</li> <li><input type="checkbox"/> Operators checklist (Integrated)</li> <li><input type="checkbox"/> RC remote check (if used)</li> <li><input type="checkbox"/> Final airframe inspection</li> <li><input type="checkbox"/> Flight Crew briefings, e.g. flight mission and safety</li> <li><input type="checkbox"/> Wind check again for launch.</li> </ul>	<b>Before Landing</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ensure UAV flight done according to mission plan.</li> <li><input type="checkbox"/> Scan landing area for obstacles.</li> <li><input type="checkbox"/> Wind check</li> <li><input type="checkbox"/> Observer briefing for landing</li> <li><input type="checkbox"/> All systems green</li> </ul>	<b>Back at office</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> Flight and Maintenance Report</li> <li><input type="checkbox"/> Charge Batteries</li> <li><input type="checkbox"/> SD card cleaned and ready to use</li> <li><input type="checkbox"/> Airframe checked</li> <li><input type="checkbox"/> Data processed</li> </ul>

APPENDIX 2

<b>Pre-Flight Report</b>	
<b>Documents</b>	
Land Owner Permission Signature	
UAS FAA Registration Number	
<b>Plan</b>	
Altitude to be flown	
Product to be applied	
Application rates	
Planned flight time, including reserves	
Number of acres to be applied	
Total volume of spray required	
<b>Roles</b>	
Chief Supervisor of Operations	
Remote-Pilot-in-Command	
Visual Observer 1	
Visual Observer 2	
Other Flight Personnel	

**APPENDIX 3**

<b>Post-Flight Report</b>	
<b>Execution of Plan</b>	
Date and time of mission	
Legal description of field	
<b>Application Conditions</b>	
Altitude flown	
Product applied	
Application rates	
Number of acres applied	
Total volume of spray	
Wind direction/speed	
Air Temperature	
Remote-Pilot-in-Command	
Visual Observer 1	
Visual Observer 2	
Other Flight Personnel	

## APPENDIX 4

### UAS MAINTENANCE AND INSPECTION BEST PRACTICES

- In the interest of assisting varying background levels of UAS knowledge and skill for all personnel. A list offering several conditions if noticed during a preflight inspection or check, could support a determination that the UAS is not in a condition for safe operations. Further investigation to identify the scope of damage and extent of possible repair needed to remedy the unsafe situation may be necessary before the flight.

Condition	Action
Structural or Skin Cracking	Further inspect to determine the scope of damage and the existence of possible hidden damage that may compromise structural integrity. Assess the need and extent of repairs for continued flight operations.
Delamination of bounded surfaces	Further inspect to determine the scope of damage and the existence of possible hidden damage that may compromise structural integrity. Assess the need and extent of repairs for continued flight operations.
Liquid or gel leakage	Further, inspect to determine the source of the leakage. This condition may pose a risk of fire resulting in extreme heat negatively impacting aircraft structures, aircraft performance characteristics, and flight duration. Assess the need and extent of repairs for continued safe flight operations.
Strong Fuel Smell	Further, inspect to determine the source of the scent. Leakage exiting the aircraft may be present or accumulating within a sealed compartment. This condition may pose a risk of fire resulting in extreme heat negatively impacting aircraft structures, aircraft performance characteristics, and flight duration. Assess the need and extent of repairs for continued safe flight operations.
Smell of electrical burning or arcing	Further, inspect to determine the source of the possible electrical malfunction. An electrical hazard may pose a risk of fire or extreme heat that will negatively impact aircraft structures, aircraft performance characteristics, and flight duration. Assess the need and extent of repairs for continued safe flight operations.
Visual indication of electrical burring or arcing (black soot tracings, sparking)	Further, inspect to determine the source of the possible electrical malfunction. An electrical hazard may pose a risk of fire or extreme heat that will negatively impact aircraft structures, aircraft performance characteristics, and flight



	duration. Assess the need and extent of repairs for continued safe flight operations.
Noticeable sound (decibel change during operation by the propulsion system)	Further, inspect the entire aircraft with emphasis on the propulsion system components (i.e., motors and propellers) for damage or diminished performance. Assess the need and extent of repairs for continued safe flight operations.
Control inputs not synchronized or delayed	Discontinue flight and avoid further flight operations until further inspection and testing of the control link between the ground control unit and the aircraft. Ensure accurate control communications are established and reliable before a flight to circumvent the possible loss of control resulting in the risk of a collision or flyaway. Assess the need and extent of repairs for continued safe flight operations.
Batter case distorted (bulging)	Further, inspect to determine the integrity of the battery as a reliable power source. Distorted battery casings may indicate impending failure resulting in abrupt power loss or explosion. An electrical hazard may be present, posing a risk of fire or extreme heat negatively impacting aircraft structures, aircraft performance characteristics, and flight duration. Assess the need and extent of repairs for continued safe flight operations.
Diminishing flight time capability (electrically powered propulsion systems)	Further, inspect to determine the integrity of the battery as a reliable power source. Diminishing battery capacity may indicate impending failure due to exhausted service life, internal, or external damage. An electrical hazard may be present, posing a risk of fire or extreme heat negatively impacting aircraft structures, aircraft performance characteristics, and flight duration. Assess the need and extent of repairs for continued safe flight operations.
Loose or missing hardware/fasteners	Further, inspect to determine the structural integrity of the aircraft and components with loose or missing hardware/fasteners. Loose or missing hardware/fasteners may pose a risk of negatively impacting flight characteristics, structural failure of the aircraft, dropped objects, loss of the aircraft, and risk to persons and property on the grounds. For continued safe flight operations, secure loose hardware/fasteners. Replace loose hardware/fasteners that cannot be secured. Replace missing hardware/fasteners.

APPENDIX 5

Dakota Unmanned Aerial  
UAS Maintenance Reporting Form

UAS Registration #	
Date/Time	
Location	
Total UAV hours	
Maintenance Tech	
Person reporting/requesting maintenance	
UAS airworthiness: In-service/Out-of-Service	
Maintenance type: Scheduled/Unscheduled	
Components involved	
Components replaced/repairs	
Additional comments	
Life Limited Parts installed/Replaced Tracking	
Function Check Flight Performed	
UAS Returned to Service: YES/NO	
Date	
Requestor of maintenance Signature	